Patent claims

1. Method for synchronizing remote clocks to a central clock via satellite,
    characterized in that

a) the remote clock is physically located as an integral component in a satellite ground station,

b) the central clock at a central ground station is connected either uninterruptedly or intermittently to one or more remote clocks via bi-directional satellite communication links called two-way links,

c) both ends of the communication link are equipped both with a transmitting device and a receiving device for satellite signals,

d) both the central clock and the remote clock in each case determine the time difference between the time of reception of the signal transmitted by the opposite station compared with the local clock. These differences are called "measurement data",

e) central clock and remote clock intermittently exchange these "measurement data" obtained at both ends, together with system-related correction data,

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f) the remote clock is synchronized in state and rate to the central clock via a control loop on the basis of the "measurement data",

g) no additional data channels need to be used for the data exchange apart from the satellite signals carrying the time information,

h) the time and frequency information thus produced in the ground station is physically available to the user in the form of suitable pulse- and/or sine wave-shaped signals called "time signals" including any digital correction values.

Further characterizations:

2. Remote synchronized clock, characterized in that

a) it has an inbuilt power reserve which allows communication interruptions to be bridged with reduced accuracy,

b) for increasing the accuracy of the information in the time signals, additional digital correction data can be available to the user,

c) the unambiguous time and date information is available at a data output,

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d) the total system is characterized by the fact that it does not need any particular facilities on board the satellite but also does not exclude these.

e) The total system operates without information about the current satellite position.

f) This is a real-time method with continuous current availability of the date, time and frequency information.

Further claims

3. Method according to one of the preceding claims, characterized in that the remote ground station is connected to the central clock via a frequency division multiple access (FDMA) method.

4. Method according to one of the preceding claims, characterized in that the remote ground station is connected to the central clock via a code division multiple access (CDMA) method.

5. Method according to one of the preceding claims, characterized in that the remote ground station is connected to the central clock via a time division multiple access (TDMA) method.

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6. Method according to one of the preceding claims, characterized in that the remote ground station is connected to the central clock via one or more satellites.

7. Method according to one of the preceding claims, characterized in that the remote ground station is connected to a system of redundant central clocks via a multiplex method.

8. Method according to one of the preceding claims, characterized in that an arbitrary number of remote ground stations is connected to the central clock via a multiplex method.

9. Method according to one of the preceding claims, characterized in that an arbitrary number of remote ground stations is connected to a redundant system of central clocks via a multiplex method.

10. Method according to one of the preceding claims, characterized in that a transparent transponder is located on board the satellite.

11. Method according to one of the preceding claims, characterized in that a regenerative transponder is located on board the satellite.

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12. Method according to one of the preceding claims, characterized in that the user is informed in digital form of the current state of the remote clock with respect to the central clock.

13. Method according to one of the preceding claims, characterized in that the user is supplied with a warning signal if the deviation of the remote clock with respect to the central clock exceeds a limit value.

14. Method according to one of the preceding claims, characterized in that the respective state of the remote clocks is available in the form of telemetry data at the central clock.

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